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Secondary School Certificate Examination

July'2018

Marking Scheme — Mathematics 30/B (Compt.)

General Instructions:

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage.

2. Evaluation is to be done as per instructions provided in the marking scheme. It should not be done according to one's own interpretation or any other consideration — Marking Scheme should be strictly adhered to and religiously followed.

3. Alternative methods are accepted. Proportional marks are to be awarded.

4. In question (s) on differential equations, constant of integration has to be written.

5. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.

6. A full scale of marks - 0 to 100 has to be used. Please do not hesitate to award full marks if the answer deserves it.

7. Separate Marking Scheme for all the three sets has been given.

8. As per orders of the Hon'ble Supreme Court. The candidates would now be permitted to obtain photocopy of the Answer book on request on payment of the prescribed fee. All examiners/ Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

QUESTION PAPER CODE 30(B)
EXPECTED ANSWER/VALUE POINTS
SECTION A

1. For quadratic equation $px^2 - 3px + 9 = 0$, to have equal roots,

Discrimenant i.e. $9p^2 - 36p = 0$ $\frac{1}{2}$

$\Rightarrow \quad p = 4 \ (p \neq 0)$ $\frac{1}{2}$

2. Here $(x - 3)^2 + (2 + 6)^2 = 100$ $\frac{1}{2}$

$\Rightarrow \quad (x - 3)^2 = 36$

$\Rightarrow \quad x - 3 = \pm 6$ $\frac{1}{2}$

$\Rightarrow \quad x = 9$ or -3

3. Prime factors of 455 are 5, 7, 13 $\frac{1}{2}$

$\therefore$ Decimal expansion is non-terminating and repeating $\frac{1}{2}$

4. Here $a_{17} = a_{10} + 7$

$a + 16d = a + 9d + 7$ $\frac{1}{2}$

$\Rightarrow \quad d = 1$ $\frac{1}{2}$

5. The given equation can be written $\sqrt{3} \sin \theta = 3 \sin \theta \cos \theta$

$\sqrt{3} \sin \theta (1 - \sqrt{3} \cos \theta) = 0$

$\Rightarrow \quad \sin \theta = 0$ or $\cos \theta = \frac{1}{\sqrt{3}}$ $\frac{1}{2}$

$\therefore \quad \sin\theta = \sqrt{1-\cos^2\theta} = \sqrt{1-\frac{1}{3}} = \sqrt{\frac{2}{3}}$ $\frac{1}{2}$

$\therefore \quad \sin\theta = 0$ or $\sqrt{\frac{2}{3}}$

6. $\left(\frac{BC}{EF}\right)^2 = \frac{36}{81}$

$\Rightarrow \quad \frac{BC}{EF} = \frac{6}{9}$ $\frac{1}{2}$

$\Rightarrow \quad BC = \frac{6\times 6.9}{9} = 4.6\,\text{cm}$ $\frac{1}{2}$

SECTION B

7. Total number of balls = 18

P(White or blue) = $\frac{5+2}{18} = \frac{7}{18}$ 1

P(Neither white nor black) = $\frac{9}{18}$ or $\frac{1}{2}$ 1

8. Here a = 17, a_n = 350, d = 9

Let the number of terms be n.

$\therefore \quad 17 + (n-1)9 = 350$ $\frac{1}{2}$

$\Rightarrow \quad n = 38$ $\frac{1}{2}$

$\therefore \quad S_{38} = \frac{38}{2}(17+350)$ $\frac{1}{2}$

$= \quad 6973$ $\frac{1}{2}$

9. $\left.\begin{aligned} 117 &= 65\times 1 + 52 \\ 65 &= 52\times 1 + 13 \\ 52 &= 13\times 4 + 0 \end{aligned}\right\}$ 1

$13 = 65 - 52$

$= 65 - (117 - 65)$

$= 2 \times 65 - 117 \Rightarrow m = 2$ 1

10. Here $PA^2 = PB^2$

$\Rightarrow \quad (x-1)^2 + (y-4)^2 = (x+1)^2 + (y-2)^2$ 1

$\Rightarrow \quad x + y = 3$ 1

11. For a pair of linear equation to have unique solution.

$\frac{k}{3} \neq \frac{-2}{1}$ 1

$\Rightarrow \quad k \neq -6$ 1

12. Multiples of 3 and 4 are 12, 24, 36, 48 1

P(Multiples of 3 and 4) = $\frac{4}{50}$ or $\frac{2}{25}$ 1

SECTION C

13. In Euclid's division lemma.

Let a be a positive odd integer and b = 4 1

$a = 4q + r, 0 \leq r < 4$

So a can be 4q, 4q + 1, 4q + 2 or 4q + 3.

However, since a is even so a cannot be 4q + 1 and 4q + 3 1

So, any even integer is of the form 4q and 4q + 2. 1

14. Let the digit at units place be x

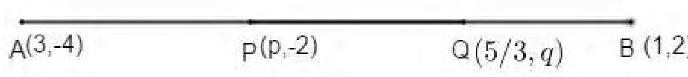
$\therefore$ The digit at tens place = 9 – x 1

As per question, $10(9 - x) + x + 27 = 10x + (9 - x)$

$\Rightarrow \quad x = 6$ 1

$\therefore$ Required number is 36 1

15. P divides AB in the ratio 1:2



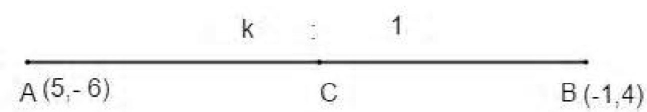
$\therefore \quad \dfrac{1\times 1+2\times 3}{3} = p \;\Rightarrow\; p = \dfrac{7}{3}$ 2

Q is the mid-point of PB,

$\therefore \quad \dfrac{-2+2}{2} = q \Rightarrow q = 0$ 1

OR

Let y-axis divide join of AB in the ratio k:1



$\therefore \quad \dfrac{k\times(-1)+1\times 5}{k+1} = 0$

$\Rightarrow \quad k = 5$ $1\frac{1}{2}$

$\therefore \quad y = \dfrac{5\times 4+1\times(-6)}{6} = \dfrac{14}{6}$ or $\dfrac{7}{3}$ 1

$\therefore$ Required point on y axis is $\left(0, \dfrac{7}{3}\right)$ $\frac{1}{2}$

16. The polynmial having two zeroes $2+\sqrt{3}$ and $2-\sqrt{3}$ is

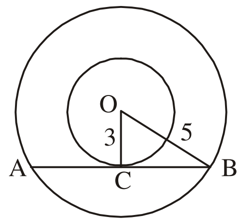
$(x-2+\sqrt{3})\,(x-2-\sqrt{3}) = (x-2)^2 - 3$

$= x^2 - 4x + 1$ 1

Now $(x^4 - 6x^3 - 26x^2 + 138x - 35) \div (x^2 - 4x + 1) = x^2 - 2x - 35$ 1

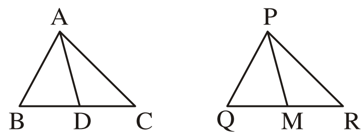
$x^2 - 2x - 35 = (x-7)\,(x+5)$

$\therefore$ Other zeroes are 7 and –5 1

17. 

Here $BC = \sqrt{5^2 - 3^2} = 4$ cm $1\frac{1}{2}$

$\therefore \quad AB = 2BC = 8$ cm $1\frac{1}{2}$

18. 

$\Delta ABC \sim \Delta PQR$

$\therefore \quad \frac{AB}{PQ} = \frac{AC}{PR} = \frac{BC}{QR}$ 1

and $\angle A = \angle P, \angle B = \angle Q, \angle C = \angle R.$

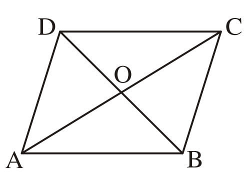
Now $BC = 2BD$ and $QR = 2QM$.

$\therefore \quad \frac{AB}{PQ} = \frac{AC}{PR} = \frac{2BD}{2QM}$ 1

i.e. $\frac{BD}{QM} = \frac{AB}{PQ} \Rightarrow \Delta ABD \sim \Delta PQM$

$\Rightarrow \quad \frac{AB}{PQ} = \frac{AD}{PM}$ 1

OR



ABCD is a rhombus where diagonals intersect at O.

Let $AB = a$, $AO = x$ and $OB = y$ 1

In ΔAOB, $AO^2 + OB^2 = AB^2$

$\Rightarrow \quad x^2 + y^2 = a^2$ $\frac{1}{2}$

$\Rightarrow \quad 4x^2 + 4y^2 = 4a^2$

$\Rightarrow \quad (2x)^2 + (2y)^2 = 4a^2$

$\Rightarrow \quad AC^2 + BD^2 = 4a^2$ 1

Thus sum of the squares of the sides of a rhombus is equal to sum of the squares of diagonals. $\frac{1}{2}$

19. L.H.S. $= \dfrac{\sin^2\theta + (1+\cos\theta)^2}{\sin\theta\,(1+\cos\theta)} = \dfrac{2+2\cos\theta}{\sin\theta\,(1+\cos\theta)}$ 1

$= \dfrac{2(1+\cos\theta)}{\sin\theta\,(1+\cos\theta)}$ 1

$= 2\,\text{cosec}\,\theta$ 1

OR

$\cos\theta + \sin\theta = \sqrt{2}\cos\theta$

$\Rightarrow \quad \sin\theta = (\sqrt{2}-1)\cos\theta$ 1

$\Rightarrow \quad \sin\theta = \dfrac{(\sqrt{2}-1)(\sqrt{2}+1)}{\sqrt{2}+1}\cos\theta$ 1

$\Rightarrow \quad \sin\theta = \dfrac{\cos\theta}{\sqrt{2}+1}$

$\Rightarrow \quad \sqrt{2}\sin\theta = \cos\theta - \sin\theta$ 1

20. Length of arc $= 2\pi r \cdot \dfrac{\theta}{360°}$ $\frac{1}{2}$

$= 2 \times \dfrac{22}{7} \times 21 \times \dfrac{60°}{360°}$

$= 22$ cm 1

Area of sector $= \pi r^2 \cdot \dfrac{\theta}{360°}$ $\frac{1}{2}$

$= \dfrac{22}{7} \times 21 \times 21 \times \dfrac{60°}{360°}$

$= 231\ \text{cm}^2$ 1

21. Volume of ice-cream in 4 cylinders

$= 4 \times \pi r^2 \times h$

$= 4 \times \dfrac{22}{7} \times \dfrac{21}{2} \times \dfrac{21}{2} \times 38$

$= 66 \times 21 \times 38\ \text{cm}^3$ 1

Volume of a cone with hemispherical top $= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$= \frac{1}{3}\pi r^2 (h + 2r)$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}(12 + 7)$

$= \frac{11 \times 7 \times 19}{6}\,\text{cm}^3$ 1

$\therefore$ Total number of cones $= \frac{66 \times 21 \times 38 \times 6}{11 \times 7 \times 19}$

$= 216$ 1

OR

Volume of hollow spherical shell $= \frac{4}{3}\pi(5)^3 - \frac{4}{3}\pi(3)^3$

$= \frac{4}{3}\pi \times 98\,\text{cm}^3$ 1

Let the height of cylinder be x cm

$\therefore$ Volume of cylinder $= \pi r^2 h = \pi(7)^2 h\,\text{cm}^3$ 1

i.e. $\pi(7)^2 \times h = \frac{4}{3}\pi \times 98$

$\Rightarrow$ $h = \frac{8}{3}\,\text{cm}$ or $2\frac{2}{3}\,\text{cm}$ 1

22.

Classes	**Frequency**	**c.f**
0-10	8	8
10-20	12	20
20-30	10	30
30-40	11	41
40-50	9	50

Here $\frac{n}{2} = 25$, $l = 20$, cf = 20, f = 10, h = 10 1

$$\text{Median} = 1 + \frac{\frac{n}{2} - c}{f} \times h$$ 1

$$= 20 + \frac{25-20}{10} \times 10$$

$$= 25$$ 1

SECTION D

23. $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$

$\Rightarrow \quad \frac{x+2+2(x+1)}{x^2+3x+2} = \frac{4}{x+4}$ 1

$\Rightarrow \quad (3x+4)(x+4) = 4(x^2+3x+2)$

$\Rightarrow \quad 3x^2 + 16x + 16 = 4x^2 + 12x + 8$

$\Rightarrow \quad x^2 - 4x - 8 = 0$ 1

$\Rightarrow \quad x = \frac{4 \pm \sqrt{16+32}}{2}$ 1

$= \frac{4 \pm 4\sqrt{3}}{2} = 2 \pm 2\sqrt{3}$

Hence, $x = 2 + 2\sqrt{3}$ or $2 - 2\sqrt{3}$ 1

OR

Let the time taken by first pipe to fill a tank = x hour
and the time taken by second pipe to fill the tank $= (x+10)$ hours. 1

As per question $\frac{1}{x} + \frac{1}{x+10} = \frac{1}{12}$ 1

$\Rightarrow \quad \frac{(x+10)+x}{x(x+10)} = \frac{1}{12}$

$\Rightarrow \quad (2x + 10)12 = x(x + 10)$

$\Rightarrow \quad x^2 - 14x - 120 = 0$

$\Rightarrow \quad (x - 20)\,(x + 6) = 0$ 1

$\Rightarrow \quad x = 20$ hours $\Rightarrow$ Second pipe can fill in 30 hours. 1

24. Correctly stated given and to prove 2

Correct proof 2

OR

Correctly stated given and to prove 2

Correct proof 2

25. Writing correct steps of construction of ΔABC 2

Writing correct steps for constructing similar triangle 2

26. Hera a = 5. Let 'd' be the common difference.

Also $S_4 = \frac{1}{2}(S_8 - S_4)$

$\Rightarrow \quad S_8 = 3S_4$ 1

$S_8 = 4\{10 + 7d\} = 40 + 28d$ 1

$S_4 = 2\{10 + 3d\} = 20 + 6d$ 1

$\therefore \quad 40 + 28d = 3(20 + 6d)$

$10d = 20 \Rightarrow d = 2$ 1

OR

Let the three numbers in A.P. be $x - d, x, x + d$. 1

$\therefore \quad x - d + x + x + d = 15 \Rightarrow x = 5$ 1

$x(x - d)\,(x + d) = 105$

$\Rightarrow \quad 5(5^2 - d^2) = 105$

$\Rightarrow \quad 25 - d^2 = 21$

$\Rightarrow \quad d^2 = 4 \Rightarrow d = \pm 2$ 1

$\therefore$ Required number are 3, 5, 7 1

27. L.H.S. = $n(m^2 - 1)$

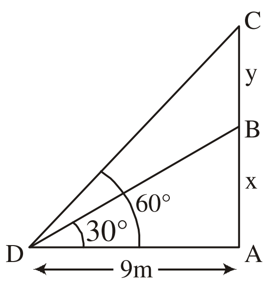
$= (\sec\theta + \operatorname{cosec}\theta)\,[(\sin\theta + \cos\theta)^2 - 1]$ 1

$= \left(\dfrac{1}{\cos\theta} + \dfrac{1}{\sin\theta}\right)(\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta - 1)$ 1

$= \dfrac{\sin\theta + \cos\theta}{\sin\theta\cos\theta} \times 2\sin\theta\cos\theta$ 1

$= 2(\sin\theta + \cos\theta) = 2m = \text{R.H.S.}$ 1

28.



Let AB, the vertical tower = x m

and BC, the flag pole = y m

$\dfrac{x}{9} = \tan 30° = \dfrac{1}{\sqrt{3}}$ 1

$\Rightarrow \quad x = \dfrac{9}{\sqrt{3}} = 3\sqrt{3}$ m

Also $\dfrac{x+y}{9} = \tan 60° = \sqrt{3}$ 1

$3\sqrt{3} + y = 9\sqrt{3}$

$\Rightarrow \quad y = 9\sqrt{3} - 3\sqrt{3} = 6\sqrt{3}$ m 2

Height of tower = $3\sqrt{3}$ m

Height of flag pole = $6\sqrt{3}$ m

29. Volume of frustum = $\dfrac{1}{3}\pi h\,(r_1^2 + r_2^2 + r_1 r_2)$ 1

$= \dfrac{1}{3} \times \dfrac{22}{7} \times 40\,(14^2 + 35^2 + 14 \times 35)$ 1

$= \dfrac{880}{21}(196 + 1225 + 490)$

$= \frac{880}{21} \times 1911 = 880 \times 91$

$= 80080 \text{ cm}^3$

$= 80.080$ litres $\frac{1}{2}$

S.P. = ₹ 80.08×35

= ₹ 2802.80 $\frac{1}{2}$

Help the economically weeker section/any value 1

30.

Classes	f_i	x_i	$d_i = x_i - 50$	$u_i = \frac{d_i}{20}$	$f_i u_i$	
0-20	5	10	–40	–2	–10	
20-40	f_1	30	–20	–1	$-f_1$	
40-60	10	50	0	0	0	
60-80	f_2	70	20	1	f_2	
80-100	7	90	40	2	14	
100-120	8	110	60	3	24	
	$30 + f_1 + f_2$				$28 - f_1 + f_2$	2

Here $30 + f_1 + f_2 = 50 \Rightarrow f_1 + f_2 = 20$

Also $62.8 = 50 + \frac{28 - f_1 + f_2}{50} \times 20 \Rightarrow f_2 - f_1 = 4$ 1

Solving $f_1 = 8, f_2 = 12$ 1